

Appl. No. 10/683,603  
Reply to Office Action of August 02, 2006

Atty. Dkt. No.:  
UCF-269DIV

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims**

**Claims 1 – 14 (Cancelled).**

**Claims 15 – 19 (Withdrawn).**

**Claim 20 (Cancelled).**

**Claim 21 (Currently Amended).** An apparatus for generating electricity and sustainable CO<sub>2</sub>-free production of hydrogen and carbon via continuous thermocatalytic decomposition of hydrocarbons over carbon-based catalyst in air and/or water-free environment, employing continuous reactivation of the catalyst, comprising the combination of:

- (a) a thermocatalytic reactor with a moving bed of carbon particulates;
  - (b) means for purging the moving bed of carbon particulates of moisture and air;
  - (b)-(c) means for recovering hydrogen-containing gas from said the reactor;
  - (d) means for separating the hydrogen-containing gas of step (c) into a first portion of pure hydrogen and a second portion of hydrogen-depleted gas;
  - (e) (e) means for recycling at least a portion of hydrogen-depleted gas to said the reactor to sustain high catalytic activity of the carbon catalyst in-situ;
  - (d) (f) means for recovering disintegration of carbon particles after said from the reactor;
- and
- (g) means for disintegration of carbon particles of step (f);

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~~(e)~~ (h) means for heating of carbon particles to provide externally activated catalyst that is recycled to the reactor;

~~(f)~~ (i) means for recovering pure hydrogen from said the stream; and

~~(g)~~ (j) means for transporting said the pure hydrogen into anode of a fuel cell, whereby electricity is generated.

Claim 22 (Currently Amended). The apparatus of claim 21, where the thermocatalytic reactor with a moving bed of carbon particulates reactor is a fluidized bed reactor.

Claim 23 (Original). The apparatus of claim 21, where the carbon particulate is carbon black.

Claim 24 (Currently Amended). The apparatus of claim 15, where the means ~~of~~ for recovering pure hydrogen is a membrane gas separation unit.

Claim 25 (Currently Amended). The apparatus of claim 21, where the means ~~of~~ for disintegration is a grinder.

Claim 26 (Currently Amended). The apparatus of claim 21, where the ~~means of transporting fuel cell for and~~ generating electricity is a polymer electrolyte membrane fuel cell.